# TOWARD AN UNDERSTANDING OF CLUSTER EVOLUTION: A DEEP X-RAY SELECTED CLUSTER CATALOG FROM ROSAT

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Final Report

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The Smithsonian Astrophysical Observatory
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In the past year, we have focussed on studying individual clusters found in this sample with Chandra, as well as using Chandra to measure the luminosity-temperature relation for a sample of distant clusters identified through the ROSAT study, and finally we are continuing our study of fossil groups.

For the luminosity-temperature study, we compared a sample of nearby clusters with a sample of distant clusters and, for the first time, measured a significant change in the relation as a function of redshift (Vikhlinin et al. in final preparation for submission to ApJ).

We also used our ROSAT analysis to select and propose for Chandra observations of individual clusters. We are now analyzing the Chandra observations of the distant cluster A520, which appears to have undergone a recent merger.

Finally, we have completed the analysis of the fossil groups identified in ROSAT observations. In the past few months, we have derived X-ray fluxes and luminosities as well as X-ray extents for an initial sample of 89 objects. Based on the X-ray extents and the lack of bright galaxies, we have identified 16 fossil groups. We are comparing their X-ray and optical properties with those of optically rich groups. A paper is being readied for submission (Jones, Forman, and Vikhlinin in preparation).

# THE EXTENDED MUSEUM: SKY ABOVE, DESERT BELOW

The Santa Rita Mountains of the Coronado National Forest, comprising some 51,600 hectares (129,000 acres) of multiple-use and wilderness areas, is one of southeastern Arizona's most attractive and highly used ranges. The Santa Ritas include Mount Hopkins, site of the Fred L. Whipple Observatory's research facilities; Mount Wrightson, a wilderness area; and, Madera Canyon, one of the nation's premier birdwatching and nature areas.

The FLWO Visitors Center, a part of the Smithsonian's Administrative Basecamp, is located on 5.6 hectares (14 acres) of National Forest land at the base of Mt. Hopkins on the western edge of the Santa Rita Range. The interior space of the Visitors Center offers interpretation of the natural and physical sciences, with a focus on astronomy; the exterior areas, developed in cooperation with the Forest Service, and including the patio, trailhead, picnic area, and roadway, focus on the forest's natural and cultural resources.

## Patio: Astronomy and Natural History

### Spotter Telescopes

Small telescopes, located around the perimeter of the patio are focused on local natural/astronomical landmarks, e.g. MMT, Kitt Peak National Observatory etc.)

### Native Plant Identification

Interpretive plaques depict and explain various local flora. One plaque describes a petroglyph found on the Visitors Center site during construction and relocated to the patio.)